

# PROPOSALS FOR GROUPING AND PASSPORTIZATION OF SOILS OF URBANIZED TERRITORIES LAND

**A. Khohriakova, T. Movchan, L. Vikulina**

*A. Khohriakova* ORCID ID: <https://orcid.org/0000-0003-0922-9701>

*T. Movchan, Ph.D.*, ORCID ID: <https://orcid.org/0000-0002-8914-2632>

*L. Vikulina, Ph.D.* ORCID ID: <https://orcid.org/0000-0002-5467-5439>

Odesa State Agrarian University, Department of Land Management and Cadastre  
Faculty of Engineering and Economics  
65012 Odesa Ukraine

## ABSTRACT

For a city planning cadastre, organization, planning and implementation of land management, economic activity, a scheme of supplementing the list of agricultural soils of Ukraine with cadastral and economic grouping of soils of urbanized territories is proposed, which includes two associations: 1) transformed and 2) technological (artificially created) soils - all in all 14 cadastral and economic groups. A new passport of soils of the land plot of the urbanized territory, which contains information on the quantitative and qualitative condition of soils at the time of the research has been declared. Issuance of a passport is the final stage of soil research (certification), which has legal force in the implementation of land management (removal and transfer of fertile soil layer), compensation, conducting a city planning cadastre, etc.

**Keywords:** soils of urban areas, economic and functional zoning of the city, Odessa city, urbanozem, technological soils, urban cadaster

## INTRODUCTION

There is a severe increase of urbanized land in the world in the context of a high level of technogenesis and intensive development of industrial agglomeration. In Ukraine, the area of built-up territory is 2552.9 thousand hectares, the population living in cities - 70%. An increase of the area of human settlements due to territories that have an actively functional surface and are usually represented by undisturbed natural and plowed agricultural lands, leads to a change of the ecological potential of soils on a global scale. One of the tasks of soil scientists is to predict the consequences of urbanization on global changes of the ecological functions of the soil cover. New soil-like solid and original soils form, transformation and change of the zonal soil cover take place within the settlements. Urban soils acquire specific features and properties, become a new object of research. In the world, there is an intensive development of research of urban ecosystems and the role of soils in them. Some countries at the legislative level decide on the monitoring of urban soils, their using and protection to ensure decisions and actions in the land administration system. Ukraine is currently passing the stage of development methodological principles for the study of the urban ecosystem. Regional studies of the soil cover of cities and, in general, the issues of improving the methodology of soil and soil-ecological studies, monitoring of human settlements' soils, improving methods of diagnostics and classification of soils of urbanized territories are relevant.

## RESEARCH METHODS

General scientific (systematic, analysis, synthesis, generalization) and traditional (comparative analytical) research methods were used at conducting the cadastral and economic grouping of Odessa soils.

## RESEARCH RESULTS

The Odessa city is located within the seaside-estuary physical-geographical region of the Dniester-Bug steppe region of the Black Sea loess accumulative lowland. The zonal soils of the subzone of the Southern Steppe of Ukraine in the area of the Dniester-Bug accumulative loess plain are southern chernozems, mainly low-humus heavy loamy (agro-industrial soil group 71e).

In 2015-2021, a comprehensive study of the soils of the Odessa city was carried out, and a classification scheme of soils of urbanized territories was proposed, by modernizing already existing taxonomic structures in terms of its compliance with the possibility of introducing city soils into the

classification scheme of soils of Ukraine (1988) [1]. To study the system "factors of soil formation - soil" there were made 43 key-plots, at which soils in 70 soil cuts and 24 diggings (the article describes the main subtypes of natural and anthropogenic soils in the Odessa city). At the field examination of soils, the morphological description was conducted, and soil samples were selected by genetic horizons (Fig.1).

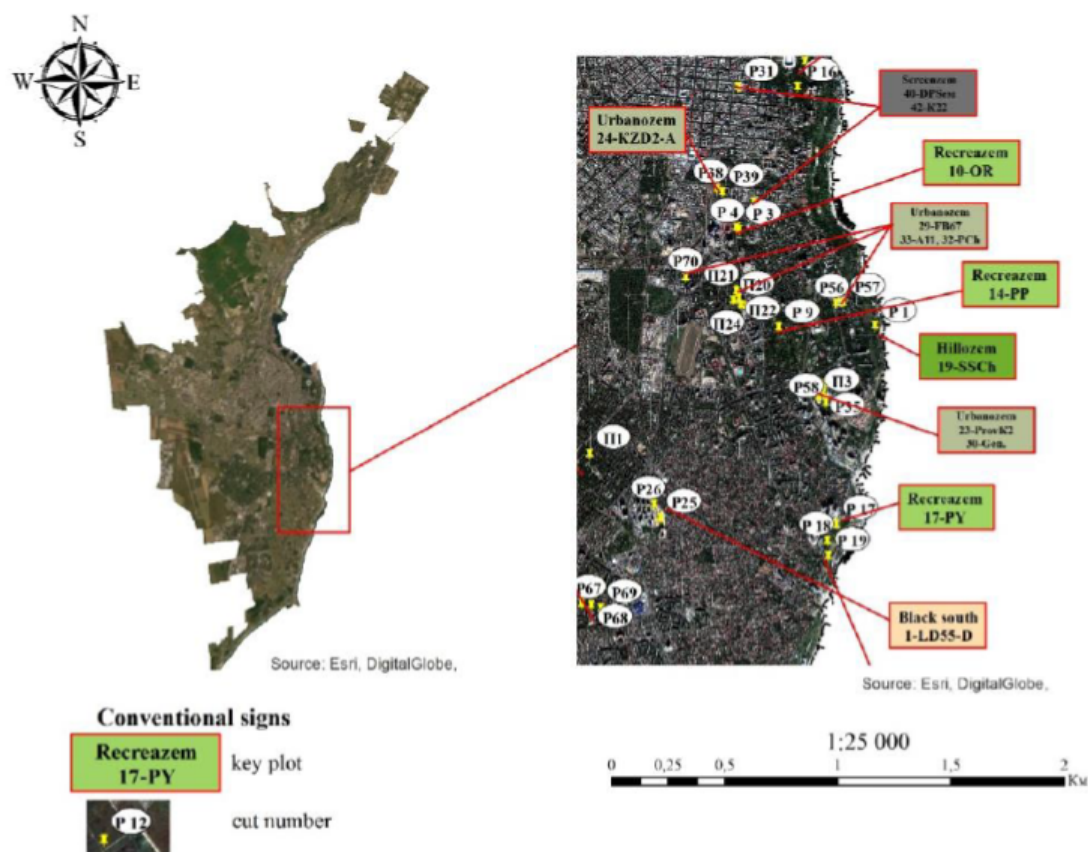


Fig. 1. Placement of main key-plots in Odessa city

The classification of soils of urbanized areas is based on profile-genetic and factor-ecological approaches. It is based on morphological features, properties, as well as the conditions of the natural and anthropogenic environment in which the soils of human settlements function, develop and transform. In the proposed classification it is used the same taxonomic units that are used in the classification of natural soils, but adapted to the soils of urbanized areas. The classification is developed for supporting the city building cadastre. Soils of urbanized territories relate to the class "Anthropogenic soils" that includes two types of soils: anthropogenically-transformed and anthropogenically-created (technological) ones.

In the data system of the urban planning cadastre, information about the ecological state of soils of land areas as an element of the natural environment of a human settlement is not covered enough, which can contribute to the acceptance of environmentally unjustified management decisions in the implementation of urban planning activities. In general, the protection of land within the city is not aimed at preserving soil fertility and its reproduction, but mainly at preventing unauthorized development and preventing the irrational use of the territory for the placement of industrial, residential and other facilities. In a critical situation in the field of environmental protection of human settlements, the need to create an ecological model of an urban planning cadastre with the provision of legal protection of soils of human settlements increases.

The proposed ecological-profile-genetic classification became the basis for carrying out the cadastral-economic grouping of these soils. At conducting the cadastral and economic grouping of settlement soils, there were taken into account not only morphologic and physical-chemical properties of soil sorts, according to which similarity groups were combined, but also the economic-functional significance of a human settlement territory.

The list of agro-industrial soil groups approved by Appendix 5 of the Resolution of the Cabinet of Ministers of Ukraine "On Approval of the Procedure for Maintaining the State Land Cadastre" dated October 17, 2012 [2] is proposed to introduce groups of transformed and technogenic (artificially created) soils of settlements and other territories with anthropogenically transformed soil cover (Table 1).

Table 1: Cadastral and economic grouping of settlement soils

Code	Soil group name		
Agroproduction soil group			
1-222	Names of agroproduction soil groups according to the approved nomenclature list		
<b>Groups of transformed and technological (artificially created) soils of human settlements and other territories with the anthropogenically transformed soil cover</b>			
223	Agrosoils (argochernozems, argomeadowzems, agroturf and so on)	230	Necrozems
224	Urbosoils (urbochernozems, argomeadowzems, agroturf and so on)	231	Intruzems
225	Recreazems	232	Industrizems
226	Culturezems	233	Dumpzems
227	Hillozems	234	Technozems
228	Urbanozems	235	Lithozems
229	Acephalozems	236	Screenzems

The group "Transformed soils" in the cadastral and economic grouping of soils of the human settlements unites soil varieties in which, under the influence of anthropogenic activity, changes in the morphological structure of the profile have occurred, while the characteristics of natural soils are preserved (anthropogenic superficially transformed soils). It also unites subtypes that are formed as a result of intensive economic activity (entire development, industrial development, transport infrastructure) (anthropogenic deeply transformed soils).

The group "Technogenic (artificially created) soils" includes subtypes that reflect purposeful changes of the soil cover by engineering, environmental guarding, organizational and other actions and sealed soils (technogenic superficially soil-like formations and sealed soils)

For conducting a city planning cadastre, it is important to take into account ecological-functional importance of a territory and also soils, spread in it. Cadastral and economic grouping of soils is based on the complex combination of morphological, agronomic, ecological, economic-functional properties of soil sorts.

Article 48 of the Law of Ukraine "On land protection" in the process of urban planning activity provides for the maximum preservation of the area of land plots with soil and vegetation cover; mandatory removal and storage of the fertile soil layer when carrying out activities related to the disturbance of the surface soil layer; prevention of changes in the hydrological regime of the land [3]. Thus, in human settlements, the main method of soil protection is the removal of the fertile soil layer during the implementation of urban planning activities. The removed fertile soil layer is stored and can be used for landscaping and improvement of unproductive land, land reclamation within the city in accordance with design documentation of land plots of any form of ownership.

The current legislation (Article 168 of the Land Code of Ukraine) provides for the procedure for landowners and land users to obtain special permission from the central executive authority, implementing state policy in the field of state control in the agro-industrial complex, to remove and transfer the soil cover of a land area [4]. Obtaining permission to convert the soil cover into the state of the soil mass is possible only if there are a duly certified land management project, an agrochemical passport of the land area and documents of title to the land area. It should be noted that the object of agrochemical certification in accordance with the Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Procedure for maintaining an agrochemical passport of a field, land area" dated October 11, 2011 is exclusively agricultural land (arable land, including irrigated, drained; hayfields and perennial pastures) [5].

In Ukraine, no survey of the soils of human settlements was carried out. At the same time, information about soil cover of a human settlement is necessary to provide the needs of maintaining an urban planning cadastre, carrying out economic activities, developing land management projects, including preserving the fertile layer during development, land reclamation, etc. It is important to have information about the presence of the fertile layer, its main indicators of fertility, the content of pollutants, the dynamics of these indicators for the development of proposals for land protection, preservation and reproduction of soils. This goal can be achieved provided that the soils of the lands of the human settlements are certified. Certification will

ensure control of the quality and ecological state of soils within the human settlement; protection of the soil cover of the human settlement during economic activities and obtaining permission for the development of land management projects for the removal and use of the fertile soil layer, development and other work related to the disturbance of the soil cover. The result of the certification is the production of a soil passport for the land area of the human settlement.

The soil passport of a land area is the main document, which may contain information on the qualitative and quantitative indicators of the properties of the soils of a human settlement. By analogy with the agrochemical passport of agricultural area, the passport of the soil of a human settlement may consist of two sections. The first section is "land cadastral" one, which indicates cadastral information: address of the land area, cadastral number, area, etc. The second section is "soil". This section should include information taking into account the characteristics of the soils of the human settlement, the needs of the urban planning cadastre and economic activity in the human settlement.

*The following structure of the passport for the "soil" section is proposed:*

1. The code of the cadastral and economic group of soils, the name of the soil and the formula of the soil profile.

2. Characteristics of the soil (thickness of the humus layer, humus content, indicator of actual acidity (pH), particle size distribution, type and degree of salinity, solonetzicity). As a separate item, it is necessary to indicate the estimated conclusion about the presence or absence of a fertile layer.

3. The content of pollutants: heavy metals and radionuclides (according to the list of the agrochemical passport) with the mandatory inclusion of mercury and fluorine in the list. A separate item must indicate the total indicator of pollution.

Taking into account the corresponding territory of the human settlement, the composition and degree of detailing of cadastral data in the system of maintaining the urban planning cadastre, which is carried out at four hierarchical levels (state, regional, district and city), it is proposed to carry out certification of soils of urbanized territories at the lowest - the city level of the urban planning cadastre. The results of this type of work should be available to a wide range of users, so they must be added to the National Cadastral System (Public Cadastral Map of Ukraine).

## CONCLUSIONS

After analyzing the legal basis for the protection of soils and lands of human settlements during urban planning activities, the need to improve legislation by creating a unified integrated system for managing the quality of soils in human settlements was determined. It is important that public administration in the field of land resources is based on the principles of sustainable development, focusing on activities aimed at preserving, reproducing fertility and soil quality within human settlements. Specialists of academic, research, design and production institutions and organizations need a clear classification scheme of these soils, methodological and diagnostic principles of their study, proper regulatory support of soil protection regulation in the field of urban planning. The practical importance of the obtained results provides widening and supplementing theoretical and methodical research bases for soils of different functional-economic zones of human settlements.

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